

A Testing Service For Industry

A little known NASA facility is making a significant contribution to national safety and industrial productivity

In the shadow of the San Andres Mountains of south central New Mexico, there is a relatively small, isolated NASA facility whose capabilities are unique in the United States, perhaps anywhere. Little known to the general public, White Sands Test Facility (WSTF) has established a world class reputation among the government/industry technical community for its expertise in the broad field of flammability and fire hazard testing and the more specific area of improving safety in materials and equipment used in oxygen systems.

A subsidiary unit of Johnson Space Center (JSC), NASA's field center for manned space flight development and operations, WSTF is primarily responsible for supporting JSC programs. In recent years, however, the facility has taken on an additional mission: helping industrial firms to design, test and operate oxygen systems with greater safety.

Although the laboratory is not officially a part of NASA's Technology Transfer Network (see page 120), it has nonetheless become a prime source of technological assistance for oxygen system producers and users, providing test data that companies could not otherwise acquire without considerable expense and difficulty, sometimes not at all.

It's a "win-win" situation. Because industry assistance is furnished on a cost-reimbursable basis, NASA is able to provide, at little or no cost to the government, a service that enhances national safety and benefits individual companies in more efficient design and better product performance. Industry gets a bargain, too, because the cost of the WSTF service is typically modest in comparison with what it would take for the company to generate the data on its own.

For example, WSTF conducted tests for General Electric Aircraft Engines, Evendale, Ohio to provide data on the flammability of several advanced alloys being considered for use in gas turbine engines; for \$19,000, GE got a wealth of data that was used to establish key guidelines for combustion resistance in the development of new alloys for jet engine compressors. For \$52,000, Exxon Research and Engineering Company, Florham Park, New Jersey acquired high temperature combustion test data that allowed selection of the best materials for use in a chemical process being developed.

Sometimes a WSTF service costs nothing at all, such as a consultation on ignition and combustion hazards, or provision of already available technical information. The Linde Division of Praxair, Inc., Tonawanda, New York was provided drawings for a high pressure, NASA-developed combustion test apparatus that enabled the company to build its own test system inexpensively by using a proven design.

There is wide and growing interest in WSTF's service among commercial firms making products that incorporate oxygen systems or operate in oxygen-enriched atmospheres. There are, first of all, the oxygen producers and manufacturers of related equipment, such as tanks and regulators. Among the major oxygen users are the builders of flight vehicles —spacecraft, rocket boosters, military aircraft, jetliners and private aircraft, and such marine craft as sub-



marines and deep submergence vehicles.

There is a great variety of oxygen equipment usage in industrial processing, particularly in the chemical and steel industries, and there is a wide range of institutional and commercial users, from such lifeguarding services as hospital care and firefighting to such outdoor activities as scuba diving and mountain climbing. Additionally, WSTF provides test data not directly related to oxygen systems, for example, flammability data on a great variety of materials tested at various atmospheres and pressures.

WSTF started life in 1962 as a facility for test of rocket propulsion systems, principally for the Apollo lunar landing program. The New Mexico desert site was chosen for its isolated location and topography, which allowed minimal hazard to the general population.

In 1967 and thereafter, WSTF's role was expanded to give NASA an advanced materials testing capability focusing on oxygen and propellant exposure environments. Initially, the laboratory concentrated on evaluating the flammability and toxicity characteristics of materials used in the Apollo program; later, WSTF expanded its horizons to include research on all facets of materials characterization, compatibility and component verification.

Over the past quarter century, WSTF's scientists and engineers have conducted an extremely comprehensive investigation toward understanding the science governing the ignition and combustion of materials and, in the process, developed an extraordinary degree of expertise in that field. The laboratory won recognition for its unique capability when, beginning in the early 1970s, the American Society for Testing and Materials, which sets standards for the nation, adopted a number of WSTF's materials and components test methods. More recently, WSTF helped develop ASTM's training course *Controlling Fire Hazards in Oxygen-Handling Systems*. The National Fire Protection Association (NFPA) has similarly acknowledged WSTF's expertise; the NASA laboratory provided the majority of the input to NFPA's current *Manual on Fire Hazards in Oxygen-enriched Atmospheres*.

By the end of the 1970s WSTF had become a national resource. As the results of the laboratory's research and testing were published in the open literature, the facility received many requests from members of the oxygen producing and oxygen equipment-using community for more information and advice on how to apply the information. That led — in 1980 — to a NASA authorization that allowed industry to take advantage of the broad expertise and the highly advanced test facilities available at WSTF.



At New Mexico's White Sands Test Facility, NASA is transferring to industry technology for improving safety in designing and operating oxygen systems. One method of transfer is classroom instruction for industry people; here NASA engineer Joel Stoltzfus (with pointer) and consultant Barry Newton (seated on table) are instructing on fire hazards and safety procedures.

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A Testing Service For Industry (Continued)

Manufacturers of oxygen systems and components often find it difficult to get testing data and hazard analysis for their equipment, information that is important to efficient design and product safety. Some companies simply do not have the facilities needed for advanced, specialized testing. Many companies do have their own facilities, but advancing technology frequently creates a need for testing that is beyond the company's in-house capability. In other cases, the kind of testing needed may be of too hazardous a nature for the company's facilities and expertise.

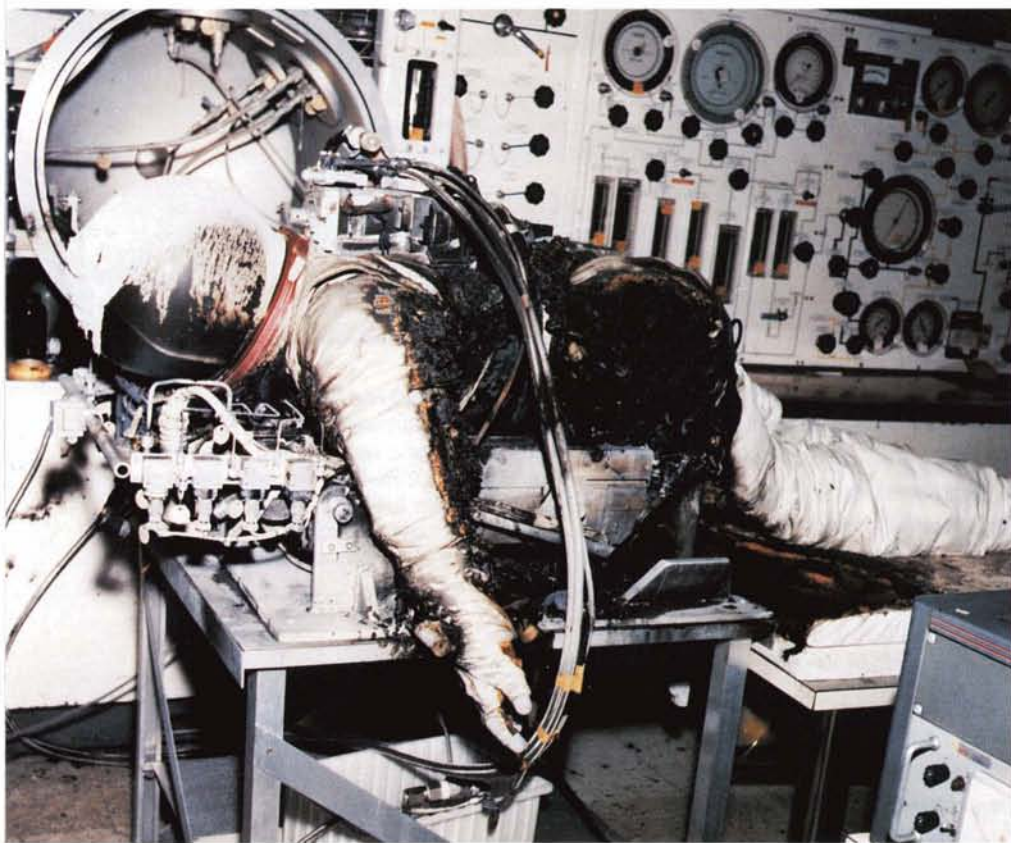
That's why NASA's decision to make WSTF's facilities available to private companies was a major boon to the oxygen systems industry. Users get the service of a top rank testing complex on a relatively inexpensive, cost-reimbursable basis and they get the test data in a timely fashion. Otherwise, they would have to purchase — or perhaps invent — the testing equipment, set it up in a protected environment and learn how to operate it, adding a lot of time and money to the cost of product development.

One of WSTF's clients is Wendell Hull & Associates (WHA), Las Cruces, New Mexico, a firm that does forensic consulting, failure analysis and accident investigation. For hazardous testing or tests WHA cannot handle in-house, the company concluded an open-end cost-reimbursable arrangement with NASA whereby WSTF does the requisite work.

The arrangement has worked to the benefit of both parties. WHA reports that it has been "significantly aided" by

WSTF's testing and analysis. WSTF, on the other hand, is now utilizing WHA's services to meet a need for a way of smoothing the path for private companies who find it difficult to get the test data they need. WHA serves as a facilitator, or liaison group, to arrange contract testing at WSTF. As part of its intermediary role, WHA is working with WSTF to cut the time it takes to set up and obtain test data; the cooperative effort has brought a significant reduction and a company can now accomplish some kinds of testing in as little as two weeks.

"The opportunity to utilize the unique facilities and expertise at NASA-WSTF has been a tremendous asset to our own failure analysis efforts," says Barry



An accidental fire in this space suit (unoccupied) triggered a safety improvement. White Sands Test Facility (WSTF) traced the cause to a high pressure regulator made of aluminum, which was replaced by a more burn resistant copper-nickel alloy.

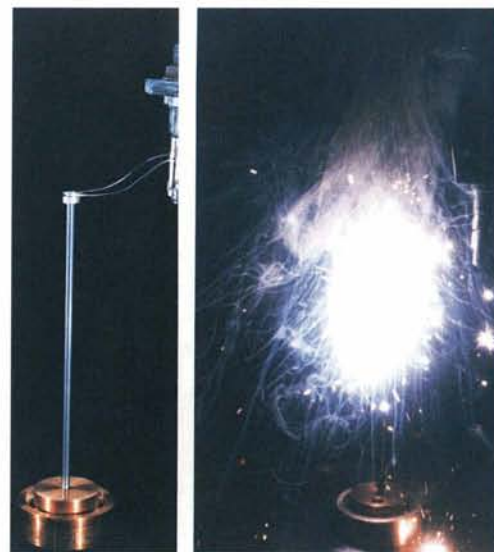
Newton of WHA. "The specific capabilities and expertise at WSTF simply do not exist, to our knowledge, anywhere else. Furthermore, we have found that private industry is extremely interested in this mechanism for obtaining cost-effective and timely testing from a one-of-a-kind world class laboratory."

WSTF has received a number of similarly enthusiastic endorsements of its service. And as the word spreads throughout the industrial community, the facility's client list is getting longer; WSTF is now getting up to five requests a week for test data or consultation. The list is already very impressive, containing some of the biggest names in American industry — names like Du Pont, AlliedSignal, Boeing Commercial Airplane Group, Hoffman-LaRoche, Inc., General Dynamics, Phillips Petroleum, TRW Inc., Lockheed Corporation, McDonnell Douglas Corporation, Rockwell International, Kimberly-Clark, General Electric, Exxon, Virginia Power and Electric and Martin Marietta Corporation. These companies all have extensive research facilities and their use of WSTF's services amounts to tacit acknowledgement that the NASA facility offers a first class testing capability and an efficient, cost-effective service.

The WSTF story exemplifies one facet of NASA's broad effort to transfer government-developed technology to the private sector in the interest of improving the productivity and competitiveness of American industry. WSTF's work is of the direct benefit variety of technology transfer wherein NASA develops or applies technology for a specific purpose — developing an advanced communications satellite, for example.

The broadest area of NASA technology transfer is the indirect benefit that accrues from "spinoff," the secondary application of technology originally developed to meet the challenging demands of NASA mainline programs. There have literally been tens of thousands of spinoffs. Collectively, they represent a substantial return on the nation's investment in aerospace research. Frequently they spark formation of new companies and thereby create new jobs; they generate lifestyle innovations and solutions to pressing public problems; and they have a stimulating influence on the national technological process, hence make a valuable contribution to the U.S. economy.

The chapters that follow contain a representative sampling of current spinoffs and illustrate how once-developed NASA technology is being reapplied in many ways and many fields of everyday life.



A flammability test at WSTF: the titanium rod in the left image is ignited and burned in an oxygen-enriched environment and scientists study combustion characteristics. WSTF conducts tests like this to help system designers select the most burn resistant metal alloys for use in oxygen systems.



WSTF performs a wide range of services for its industry clients, among them servicing of parts used on oxygen systems — cleaning, repairing, testing and packaging, all conducted in a high technology clean room environment